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**Lepidopterous Pests on Vegetable Brassicas
in Pukekohe, New Zealand:
Their Seasonality, Parasitism, and Management**

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A thesis submitted in partial fulfilment
of the requirements for the degree of
Doctor of Philosophy in Zoology
University of Auckland, 1991

Acknowledgements

This thesis was greatly aided by the advice, help, and discussions contributed by my supervisors, Dr. Peter Cameron from DSIR Plant Protection, and Prof. Euan Young from the University of Auckland. In particular I would like to thank Peter for his efforts in clarifying both the project and my thoughts, for his efforts in helping to secure funding, and for his perseverance during harvest days and in commenting on drafts of the thesis. I thank DSIR Plant Protection for providing bench space, use of vehicles, and use of the facilities both at MARC and at the Pukekohe Research Station. Dr. Brian McArdle lent me his statistical expertise, advice, and humour, for which I am indebted. I thank the New Zealand Federation of Potato and Vegetable Growers Association for helping to support this research.

Intellectual support was provided by many friends at DSIR Plant Protection; the numerous discussions of methods, techniques, gratuitous advice, and politics over coffee afforded me amusement, encouragement, and stimulating ideas. I thank Garry Hill, John Charles, John Clearwater, Graham Walker, Tim Herman, Philippa Stevens, Jo Berry, David Steven, Rosa Henderson, and Doug Allan for all of the above.

Dave Rodgers assisted in securing space and equipment in a controlled-environment room, for which I thank him. The staff at the DSIR Pukekohe Research Station provided advice, excellent land services, helping hands, and produce; I thank them all. I particularly thank Dael for her cheer and Jan and Peter for help in setting up and maintaining field plots. Many friends assisted with the harvests. I thank Peter C., Graham, Jan, Tim, Peter, Margaret and Peter W., Julie, Sue, Phillipa, Susanne, Carol, and Rosa; their only rewards for a long, dirty day in the field were free brassicas.

I thank my family, Gunthers and Becks, for their support and encouragement. My husband, Dave Beck, I thank for always being there for me.

Dedication

I would like to dedicate this thesis to the memory of my father, Professor Francis Alan Gunther.

Abstract of the thesis

The vegetable brassicas of cabbage, broccoli, and cauliflower are grown in Pukekohe for the Auckland fresh-produce markets. These brassicas are attacked by three major lepidopterous pests: diamondback moth (DBM) (*Plutella xylostella* (L.)) (Yponomeutidae), white butterfly (WB) (*Pieris rapae* (L.)) (Pieridae), and soybean looper (SBL) (*Thysanoplusia orichalcea* (F.)) (Noctuidae). Current grower strategy to combat these pests is calendar-scheduled insecticide applications. The goal of this thesis is to develop pest management alternatives.

The seasonality of these three pests is discussed. DBM and WB are each under biological control by a larval and a pupal parasitoid, but this natural control is not sufficient to allow economic harvests in cabbage and was not synchronized. No parasitoids of SBL were found. The importation of additional natural enemies is discussed.

A scouting system of the percent of cabbage plants infested coupled with an action threshold of 15% - 20% infested plants, resulted in good yields in field trials and allowed up to a 50% reduction in insecticide applications over the growth period when compared to a 14-day calendar schedule. Implementation of the 15% infested threshold in commercial cabbage fields resulted in up to an 83% reduction in insecticide applications with no yield decrease in quality or quantity.

Application of this 15% infested plant threshold to broccoli and cauliflower decreased insecticide applications by 40% and 17%, respectively. Study of larval biology indicated that all of the lepidopterans preferentially fed on leaves; timing of the first insecticide application in broccoli and cauliflower to coincide with floret initiation decreased insecticide applications by 80% and 67%, respectively. Laboratory and field trials comparing DBM oviposition preference, larval survivability, and parasitism rates between cabbage, broccoli, and cauliflower are discussed.

Knowledge of lepidopterous pest seasonality and biology, linked to careful

timing of insecticide applications to coincide with threshold levels of pests, can take full advantage of natural enemies and reduce insecticide input in the vegetable brassicas of cabbage, broccoli, and cauliflower with no decrease in crop quality.

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Voucher specimens of all parasitoid species reared have been deposited in the New Zealand arthropod collection, DSIR Plant Protection, Private Bag, Auckland, New Zealand.